

# INTERNATIONAL RECTIFIER

## 1N3879, 1N3889, 6FL, 12FL, 16FL SERIES

### 6A, 12A and 16A Fast Recovery Rectifiers

#### Major Ratings and Characteristics

	1N3879 —1N3883	1N3889 —1N3893	6FL...	12FL...	16FL...	Unit	
$I_F(AV)^{\dagger}$	6*	12*	6	12	16	A	
$I_{FSM}$	50Hz	72	145	110	145	180	A
	60Hz	75*	150*	115	150	190	A
$I^2t$	50Hz	26	103	60	103	160	A <sup>2</sup> s
	60Hz	23	94	55	94	150	A <sup>2</sup> s
$I_A\sqrt{t}$	363	1452	855	1452	2290	A $\sqrt{s}$	
$t_{rr}$ range	see table					ns	
$V_{RRM}$ range	50 — 400*		50 — 1000			V	
$T_J$ range	—65 to 150					°C	

\*JEDEC registered values.

† At max.  $T_C = 100^\circ\text{C}$ .

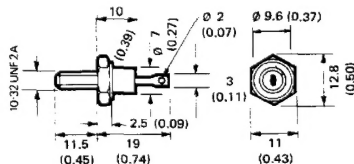
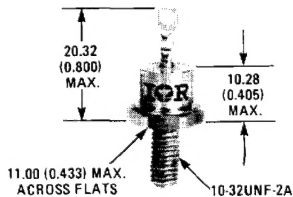
#### Description

This range of fast recovery diodes is designed for applications in DC power supplies, inverters, converters, choppers, ultrasonic systems and for use as free wheel diodes.

#### Features

- Short reverse recovery time
- Low stored charge
- Wide current range
- Excellent surge capabilities
- Standard JEDEC types
- Stud cathode and stud anode versions
- Types up to 1000V  $V_{RRM}$
- Fully characterised reverse recovery conditions

#### CASE STYLE AND DIMENSIONS



Conforms to JEDEC: DO-203AA (DO-4)  
IEC 191-2: A3U  
BS 3934: SO-10A  
DIN 41885: 101 C 2

All dimensions in millimetres (inches)

## REVERSE VOLTAGE RATINGS

Part Number ① ②			V <sub>RRM</sub> – Max. Repetitive Peak Reverse Voltage	V <sub>RRM</sub> – Max. Non-Repetitive Peak Reverse Voltage $t_p \leq 5$ ms	I <sub>R</sub> – Max. Reverse Current At Rated V <sub>R</sub>		
			V	V	T <sub>J</sub> = 25°C	T <sub>J</sub> = 100°C	T <sub>J</sub> = 150°C
					mA	mA	mA
	1N3879		50	75	0.015*	1.0*	3.0*
	1N3880		100	150	0.015*	1.0*	3.0*
	1N3881		200	250	0.015*	1.0*	3.0*
	1N3882		300	350	0.015*	1.0*	3.0*
	1N3883		400	450	0.015*	1.0*	3.0*
	1N3889		50	75	0.025*	3.0*	5.0*
	1N3890		100	150	0.025*	3.0*	5.0*
	1N3891		200	250	0.025*	3.0*	5.0*
	1N3892		300	350	0.025*	3.0*	5.0*
	1N3893		400	450	0.025*	3.0*	5.0*
**6FL6S02	6FL6S05	6FL6S10	50	75	0.050	—	6.0
6FL10S02	6FL10S05	6FL10S10	100	150	0.050	—	6.0
6FL20S02	6FL20S05	6FL20S10	200	275	0.050	—	6.0
6FL40S02	6FL40S05	6FL40S10	400	500	0.050	—	6.0
6FL60S02	6FL60S05	6FL60S10	600	725	0.050	—	6.0
—	6FL80S05	6FL80S10	800	950	0.050	—	6.0
—	6FL100S05	6FL100S10	1000	1250	0.050	—	6.0
**12FL5S02	12FL5S05	12FL5S10	50	75	0.050	—	6.0
12FL10S02	12FL10S05	12FL10S10	100	150	0.050	—	6.0
12FL20S02	12FL20S05	12FL20S10	200	275	0.050	—	6.0
12FL40S02	12FL40S05	12FL40S10	400	500	0.050	—	6.0
12FL60S02	12FL60S05	12FL60S10	600	725	0.050	—	6.0
—	12FL80S05	12FL80S10	800	950	0.050	—	6.0
—	12FL100S05	12FL100S10	1000	1250	0.050	—	6.0
**16FL5S02	16FL5S05	16FL5S10	50	75	0.050	—	6.0
16FL10S02	16FL10S05	16FL10S10	100	150	0.050	—	6.0
16FL20S02	16FL20S05	16FL20S10	200	275	0.050	—	6.0
16FL40S02	16FL40S05	16FL40S10	400	500	0.050	—	6.0
16FL60S02	16FL60S05	16FL60S10	600	725	0.050	—	6.0
—	16FL80S05	16FL80S10	800	950	0.050	—	6.0
—	16FL100S05	16FL100S10	1000	1250	0.050	—	6.0

## REVERSE RECOVERY CHARACTERISTICS

	1N3879– 1N3883	1N3889– 1N3893	6FL...			12FL...			16FL...			Unit	Conditions
			S02	S05	S10	S02	S05	S10	S02	S05	S10		
t <sub>rr</sub> Max. reverse recovery time	150	150	110	285	490	100	250	430	90	225	390	ns	T <sub>J</sub> = 25°C, I <sub>F</sub> = 1A to V <sub>R</sub> = 30V dI <sub>F</sub> /dt = 100 A/μs
	300*	300*	200	500	1000	200	500	1000	200	500	1000	ns	T <sub>J</sub> = 25°C, dI <sub>F</sub> /dt = 25 A/μs
I <sub>RM</sub> (REC) Max. peak reverse recovery current	4*	5*	—	—	—	—	—	—	—	—	—	—	I <sub>FM</sub> = π × rated I <sub>F</sub> (AV)
Q <sub>RR</sub> Max. reverse recovered charge	400	350	230	1700	5000	200	1300	3800	150	1100	3000	nC	T <sub>J</sub> = 25°C, I <sub>F</sub> = 1A to V <sub>R</sub> = 30V dI <sub>F</sub> /dt = 100 A/μs
	400	400	200	1200	5000	200	1200	5000	200	1200	5000	nC	T <sub>J</sub> = 25°C, dI <sub>F</sub> /dt = 25 A/μs I <sub>FM</sub> = π × rated I <sub>F</sub> (AV)

## ELECTRICAL SPECIFICATIONS

		1N3879— 1N3883	6FL...	1N3889— 1N3893	12FL...	16FL...	Unit	Conditions	
FORWARD CONDUCTION									
I <sub>F</sub> (AV)	Max. average forward current	6*	6	12*	16	A	180° conduction, half sine wave, T <sub>C</sub> = 100°C		
I <sub>F</sub> (RMS)	Max. r.m.s. forward current	9.5	9.5	19	25	A			
I <sub>FSM</sub>	Max. peak one-cycle non-repetitive forward current	72	110	145	180	A	t = 10 ms	With rated V <sub>RRM</sub>	Sinusoidal half wave, initial T <sub>J</sub> = 150°C
		75*	115	150*	190		t = 8.3 ms		
		85	130	170	215		t = 10 ms	V <sub>RRM</sub> = 0	
		90	135	180	225		t = 8.3 ms		
i <sup>2</sup> <sub>t</sub>	Max. i <sup>2</sup> <sub>t</sub> for fusing	26	60	103	160	A <sup>2</sup>	t = 10 ms	With rated V <sub>RRM</sub>	Initial T <sub>J</sub> = 150°C
		23	55	94	150		t = 8.3 ms		
	Max. i <sup>2</sup> <sub>t</sub> for individual device fusing	36	86	145	230		t = 10 ms	V <sub>RRM</sub> = 0	
		33	78	130	210		t = 8.3 ms		
i <sup>2</sup> √t	Max. i <sup>2</sup> √t for individual device fusing ①	363	856	1452	2290	i <sup>2</sup> √s	t = 0.1 to 10 ms		
V <sub>FM</sub>	Max. peak forward voltage	1.4*	1.4	1.4*	1.4	V	T <sub>J</sub> = 25°C, I <sub>F</sub> = rated I <sub>F</sub> (AV) (D.C.)		
		1.5*	1.5	1.5*	1.5		T <sub>C</sub> = 100°C, I <sub>FM</sub> = π × rated I <sub>F</sub> (AV)		

\* JEDEC registered value

\*\* Suffix "S02" may be omitted, i.e., 12FL10 implies 12FL10S02, 12FLR60 implies 12FLR60S02.

① Types listed are cathode to case; for anode-to-case include "R" in code, i.e., 1N3879R, 6FLR20S10, 16FLR40S02.

② I<sub>R</sub>(AV) @ rated I<sub>F</sub>(AV) and V<sub>RRM</sub>, and T<sub>C</sub> = 100°C.③ I<sub>RM</sub> @ rated V<sub>RRM</sub> and T<sub>J</sub> = 150°C.④ I<sup>2</sup>t for time t<sub>x</sub> = i<sup>2</sup>√t × √x

⑤ When these devices are ordered without a suffix, e.g., 40HFL, the order will be filled with devices that meet the S02 specification.

## Thermal and mechanical specifications

			1N3879 -1N3883 6FL...	1N3889 -1N3893 12FL...	16FL...	Units	Conditions
$T_J$	Junction operating temperature range		-65 to 150			$^{\circ}\text{C}$	
$T_{stg}$	Storage temperature range		-65 to 175			$^{\circ}\text{C}$	
$R_{thJC}$	Maximum internal thermal resistance, junction to case		2.5	2.0	1.6	deg C/W	DC operation
$R_{thCS}$	Maximum thermal resistance, case to heatsink		0.5			deg C/W	Mounting surface flat, smooth and greased.
T	Mounting torque $\pm 10\%$	to nut	10.5			lb/in	Lubricated threads (Non-lubricated threads)
			0.12			kgf.m	
			1.2			Nm	
	to device		11.5 (13.5)			lb/in	
			0.13 (0.155)			kgf.m	
			1.3 (1.35)			Nm	
wt	Approximate weight	7			g		
		0.25			oz		
		Case style			DO-203AA (DO-4)		JEDEC

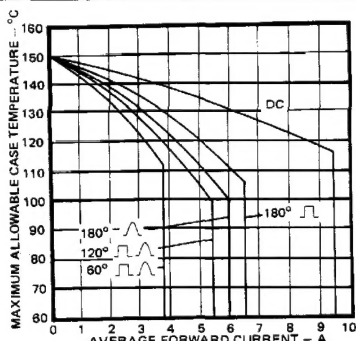


Fig. 1 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3879 and 6FL Series

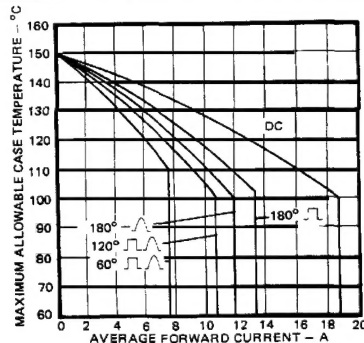


Fig. 2 - Average Forward Current Vs. Maximum Allowable Case Temperature, 1N3889 and 12FL Series

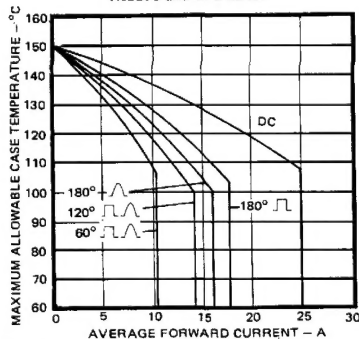
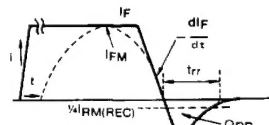


Fig. 3 - Average Forward Current Vs. Maximum Allowable Case Temperature, 16FL Series



$I_F$ ,  $I_{FM}$  = Peak forward current prior to commutation  
 $-dI_F/dt$  = Rate of fall of forward current  
 $I_{RM}(REC)$  = Peak reverse recovery current  
 $t_{rr}$  = Reverse recovery time  
 $Q_{RR}$  = Reverse recovered charge

Fig. 4 - Reverse Recovery Time Test Waveform

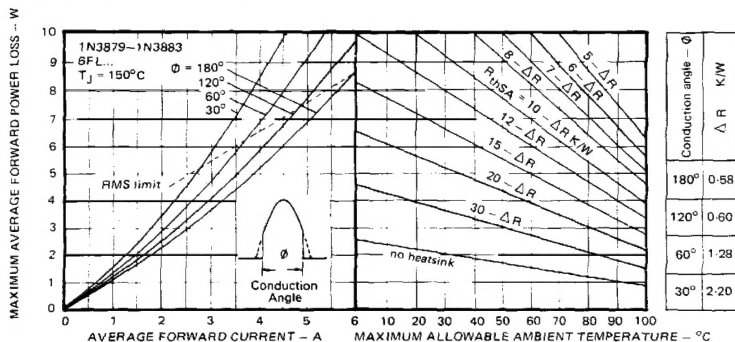


Fig. 5 - Current Rating Nomogram (Sinusoidal Waveforms), 1N3879 and 6FL Series

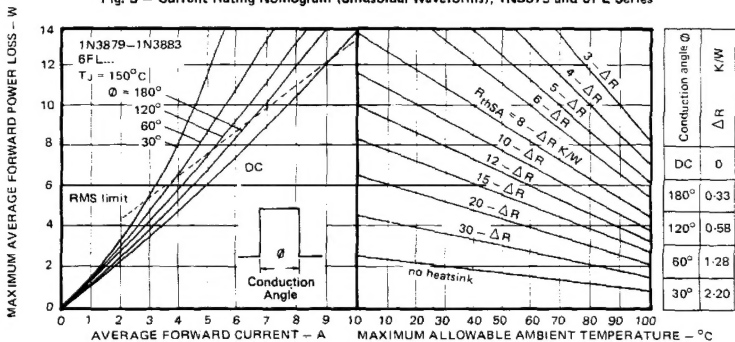


Fig. 6 - Current Rating Nomogram (Rectangular Waveforms), 1N3879 and 6FL Series

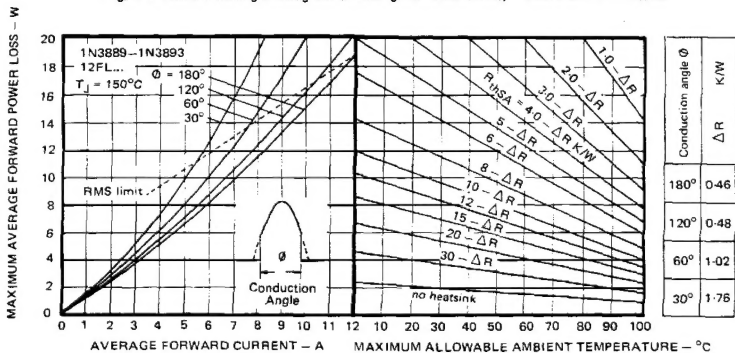
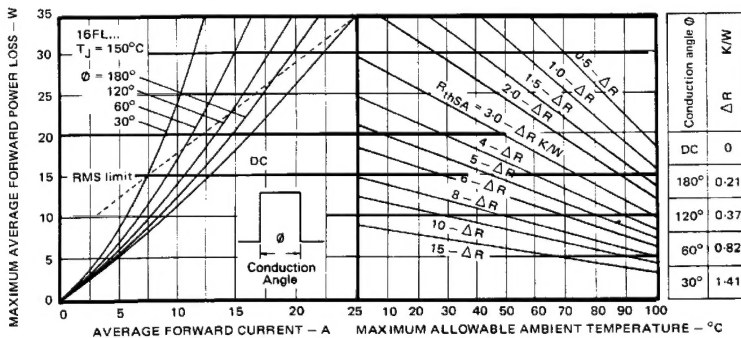
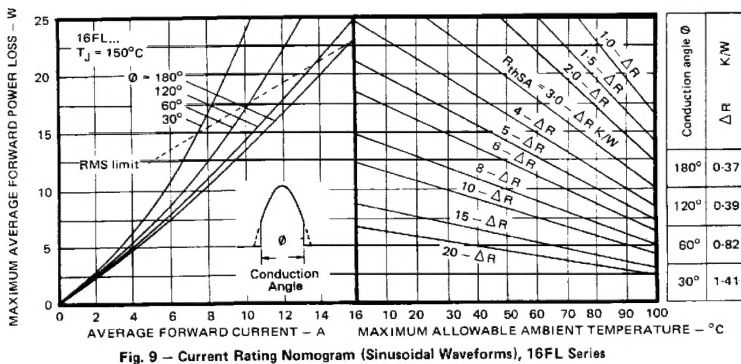
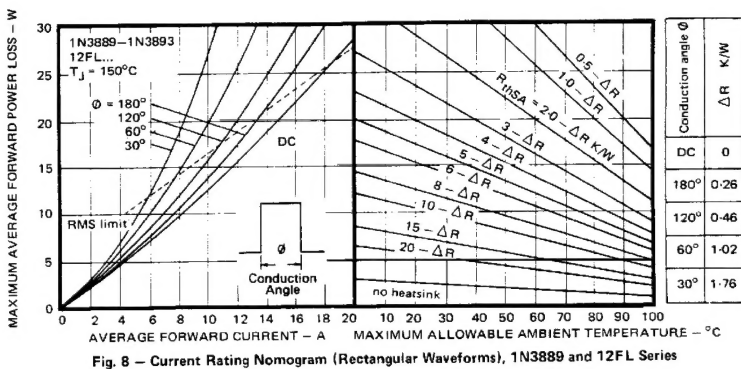


Fig. 7 - Current Rating Nomogram (Sinusoidal Waveforms), 1N3889 and 12FL Series



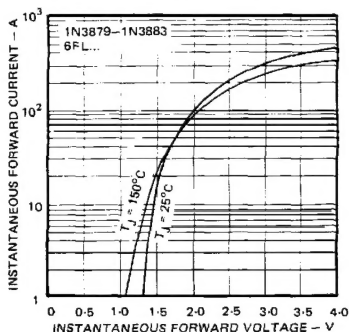


Fig. 11 - Maximum Forward Voltage Vs. Forward Current, 1N3879 and 6FL Series

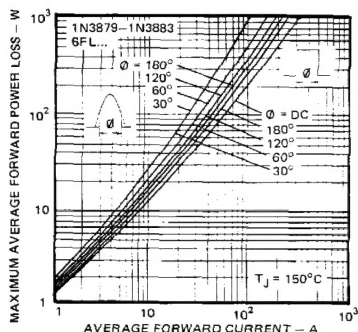


Fig. 12 - Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3879 and 6FL Series

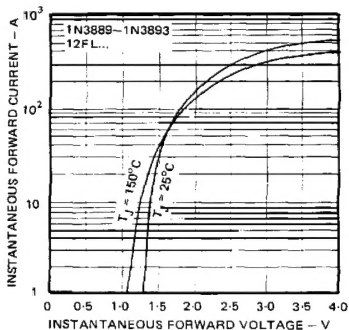


Fig. 13 - Maximum Forward Voltage Vs. Forward Current, 1N3889 and 12FL Series

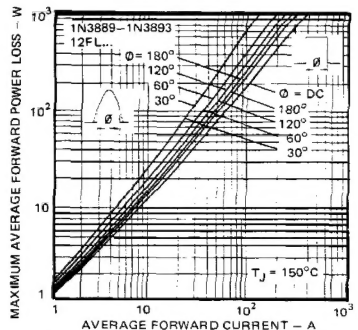


Fig. 14 - Maximum High Level Forward Power Loss Vs. Average Forward Current, 1N3889 and 12FL Series

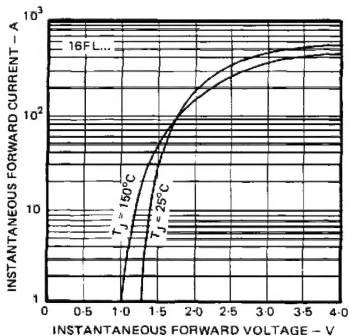


Fig. 15 - Maximum Forward Voltage Vs. Forward Current, 16FL Series

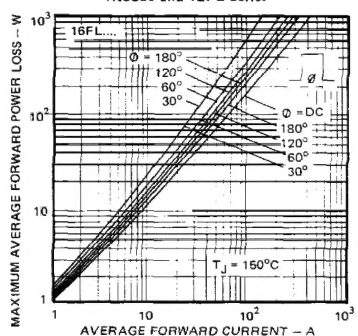


Fig. 16 - Maximum High Level Forward Power Loss Vs. Average Forward Current, 16FL Series

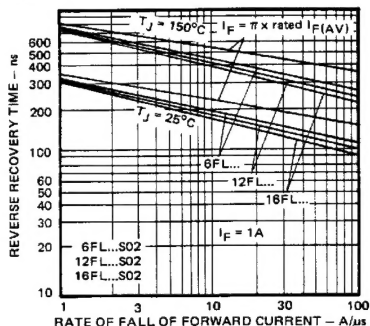


Fig. 17A - Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series \_\_S02

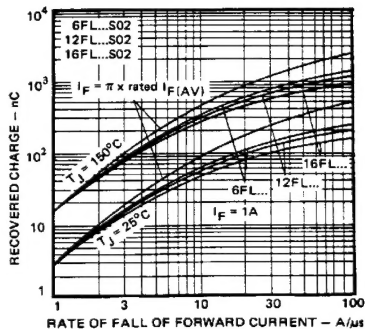


Fig. 17B - Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series \_\_S02

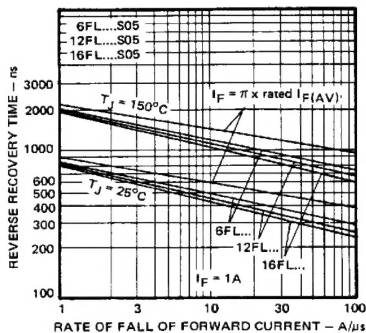


Fig. 18A - Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series \_\_S05

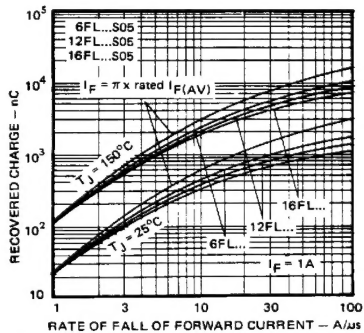


Fig. 18B - Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series \_\_S05

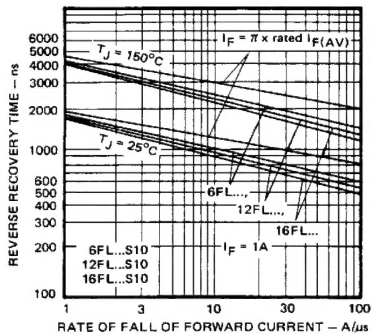


Fig. 19A - Maximum Reverse Recovery Time Vs. Rate of Fall of Forward Current, All Series \_\_S10

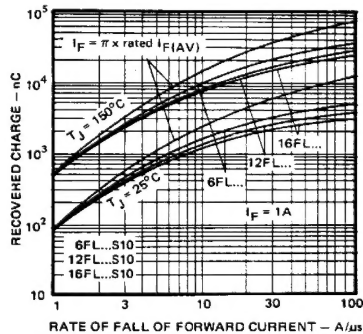


Fig. 19B - Maximum Recovered Charge Vs. Rate of Fall of Forward Current, All Series \_\_S10

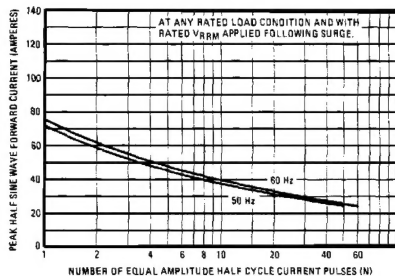


Fig. 20 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3879 Series

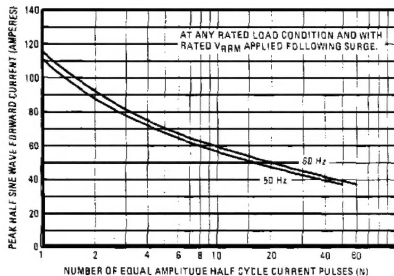


Fig. 21 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 6FL Series

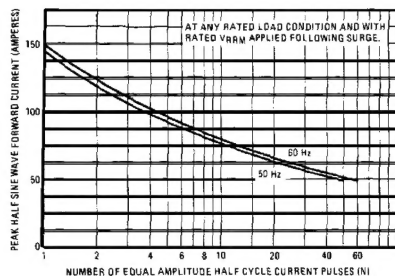


Fig. 22 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 1N3889 and 12FL Series

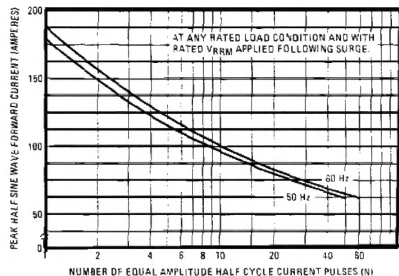


Fig. 23 - Maximum Non-Repetitive Surge Current Vs. Number of Current Pulses, 16FL Series

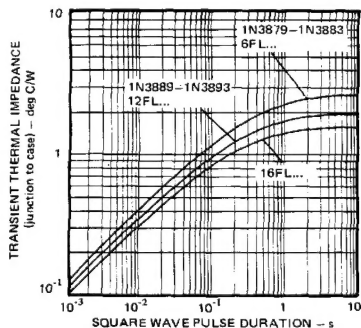


Fig. 24 - Maximum Transient Thermal Impedance, Junction-to-Case Vs. Pulse Duration, All Series.